FIG.1

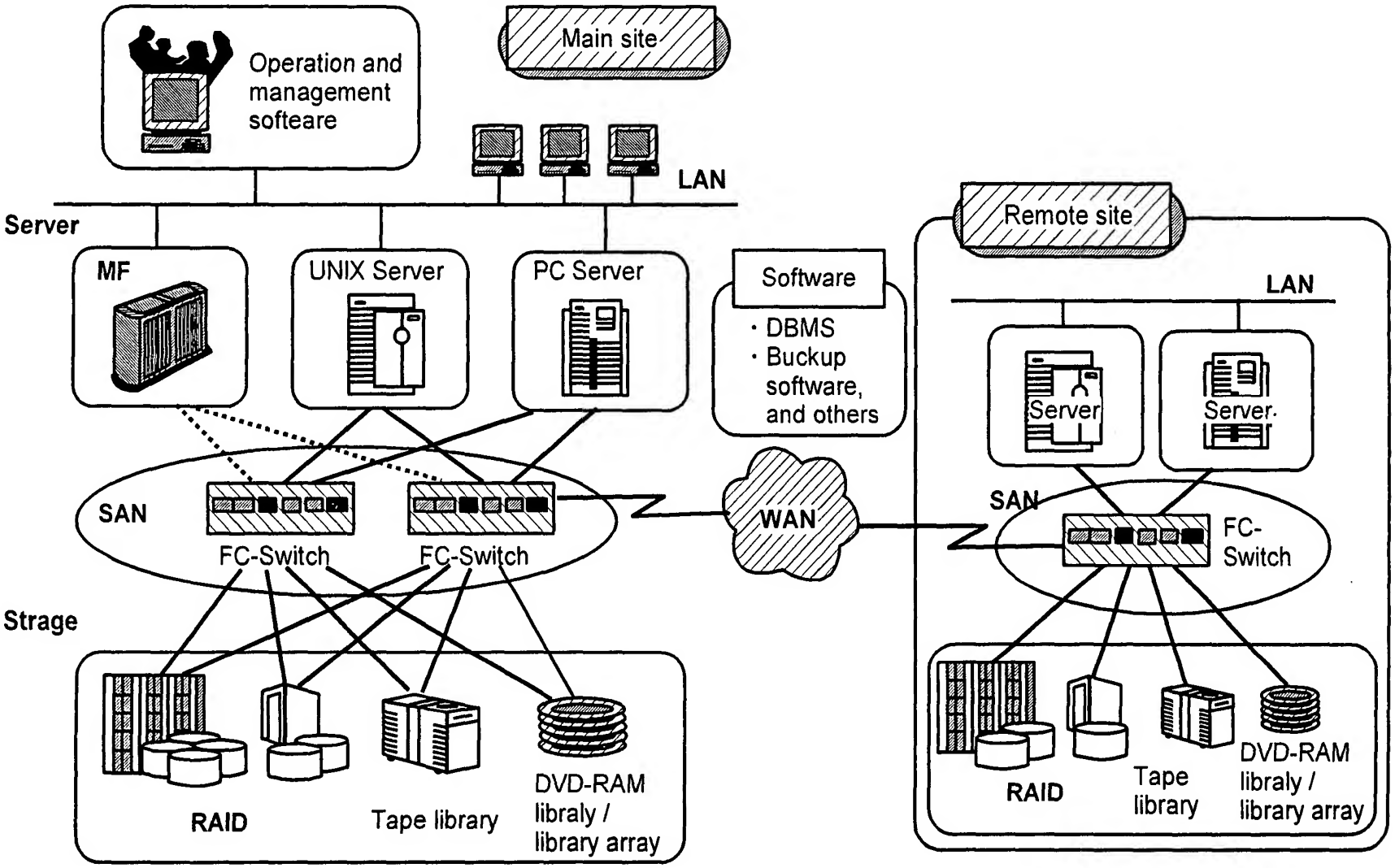

Operation and management softeare
Main site
LAN
Server
MF
UNIX Server
PC Server
Software
· DBMS
· Buckup software, and others
Remote site
LAN
Server
Server
SAN
FC-Switch
FC-Switch
WAN
SAN
FC-Switch
Strage
RAID
Tape library
DVD-RAM libraly / library array
RAID
Tape library
DVD-RAM libraly / library array

FIG.2

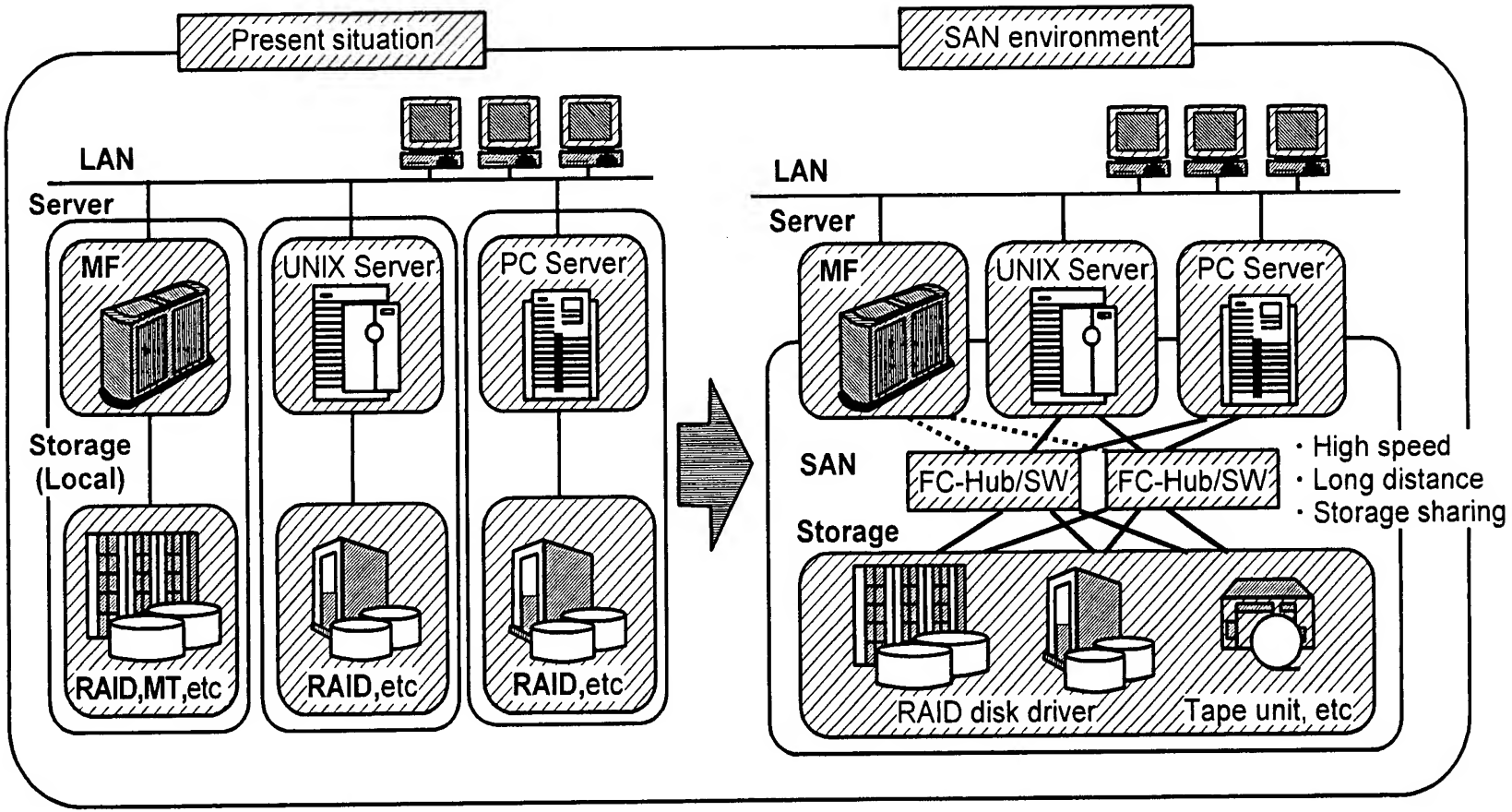

Present situation
SAN environment
LAN
Server
MF
UNIX Server
PC Server
Storage
(Local)
RAID,MT,etc
RAID,etc
RAID,etc
LAN
Server
MF
UNIX Server
PC Server
SAN
FC-Hub/SW
FC-Hub/SW
Storage
RAID disk driver
Tape unit, etc
· High speed
· Long distance
· Storage sharing

FIG.3

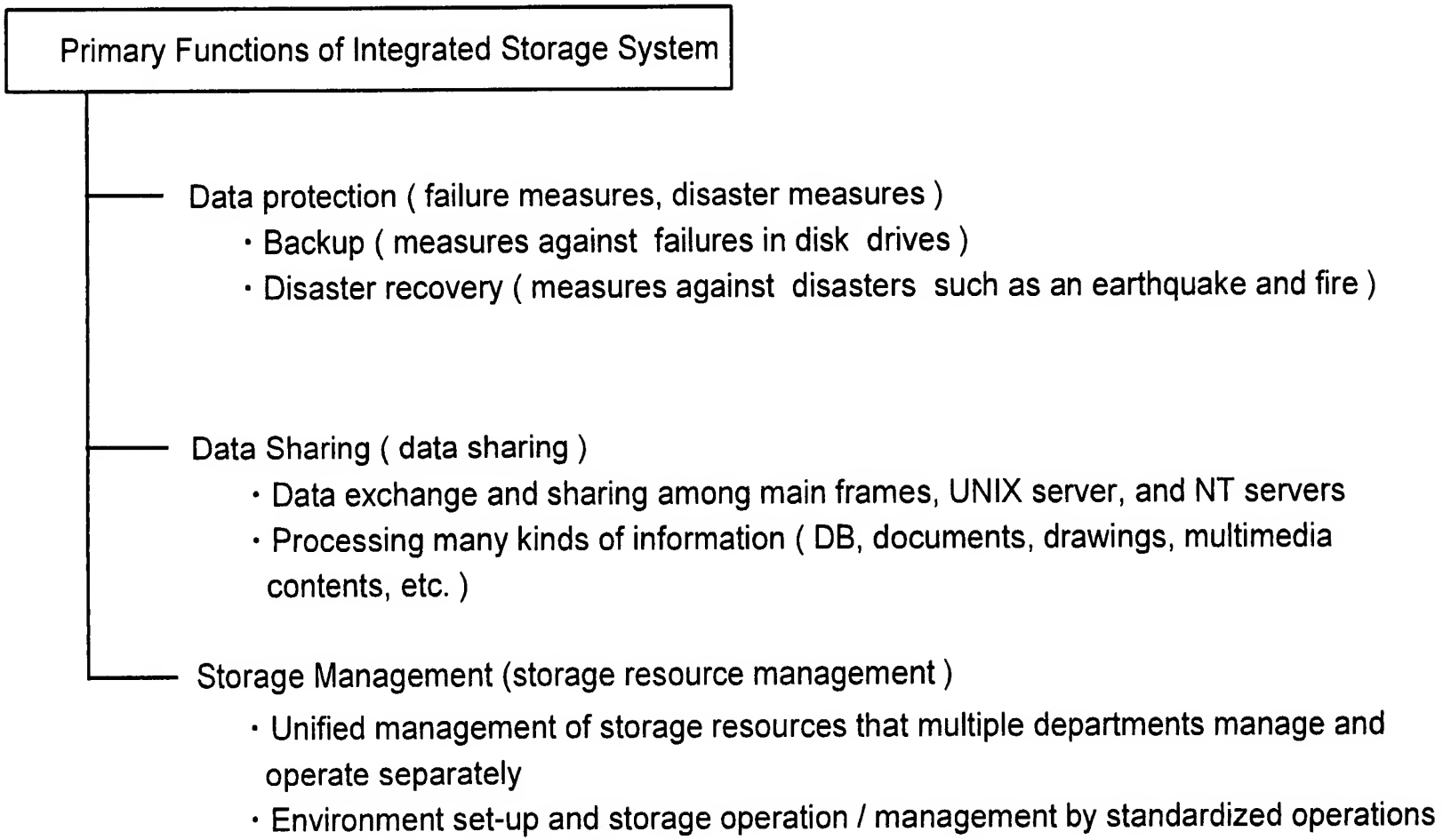

Primary Functions of Integrated Storage System
Data protection (failure measures, disaster measures)
· Backup (measures against failures in disk drives)
· Disaster recovery (measures against disasters such as an earthquake and fire)
Data Sharing (data sharing)
· Data exchange and sharing among main frames, UNIX server, and NT servers
· Processing many kinds of information (DB, documents, drawings, multimedia contents, etc.)
Storage Management (storage resource management)
· Unified management of storage resources that multiple departments manage and operate separately
· Environment set-up and storage operation / management by standardized operations

FIG.4

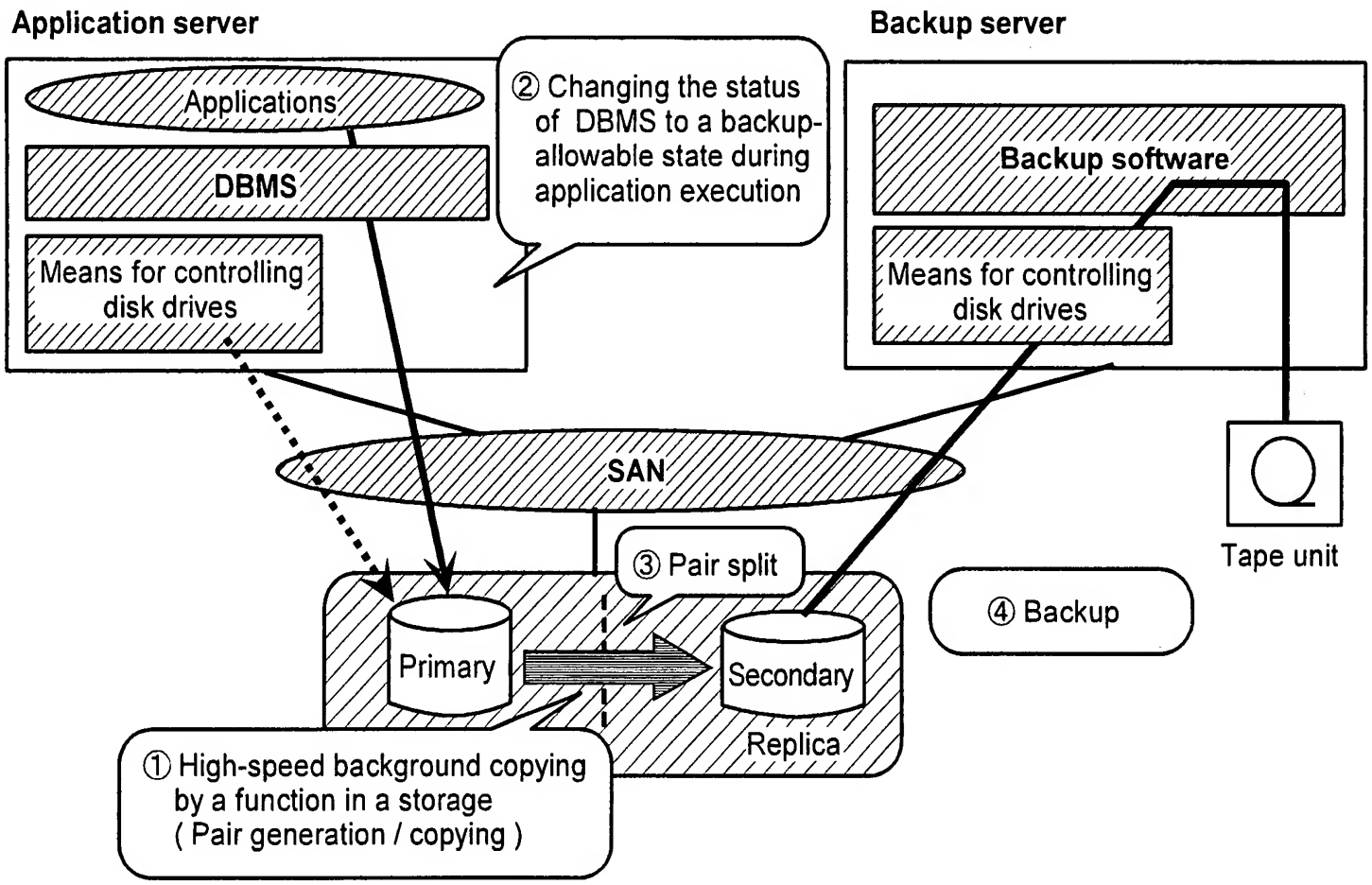
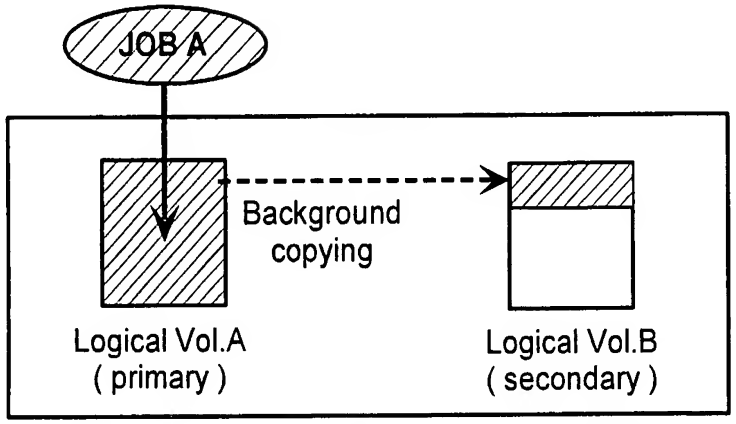
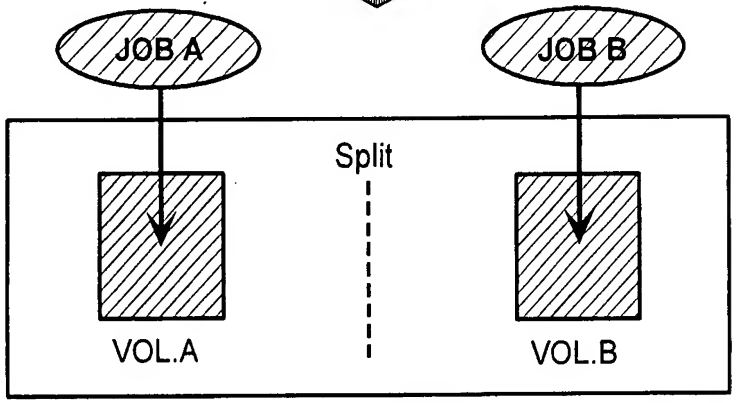

Application server
Backup server
Applications
DBMS
Means for controlling disk drives
② Changing the status of DBMS to a backup-allowable state during application execution
Backup software
Means for controlling disk drives
SAN
Tape unit
③ Pair split
④ Backup
Primary
Secondary
Replica
① High-speed background copying by a function in a storage (Pair generation / copying)

FIG.5a

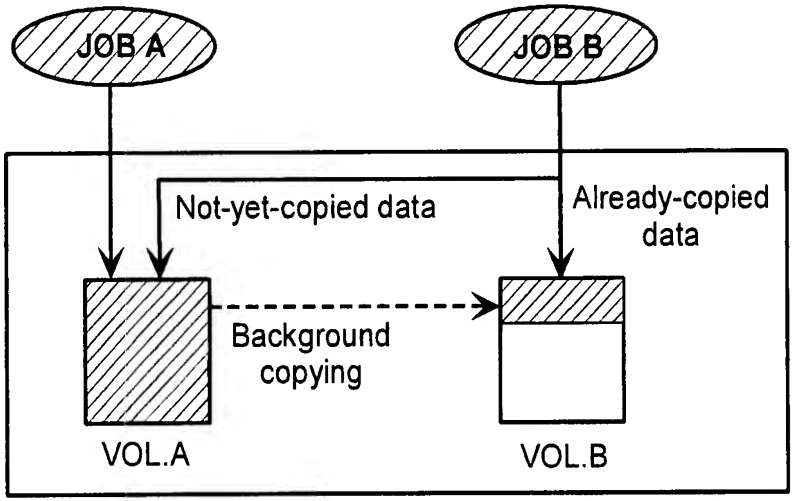


Makes a copy in the background in advance.



After copying is complete, the secondary volume is split and is available for another job to use.

FIG.5b



- Apparently, the secondary volume is split immediately and is available for another job to use.
- Actual data is copied from the primary volume in the background.

FIG.6

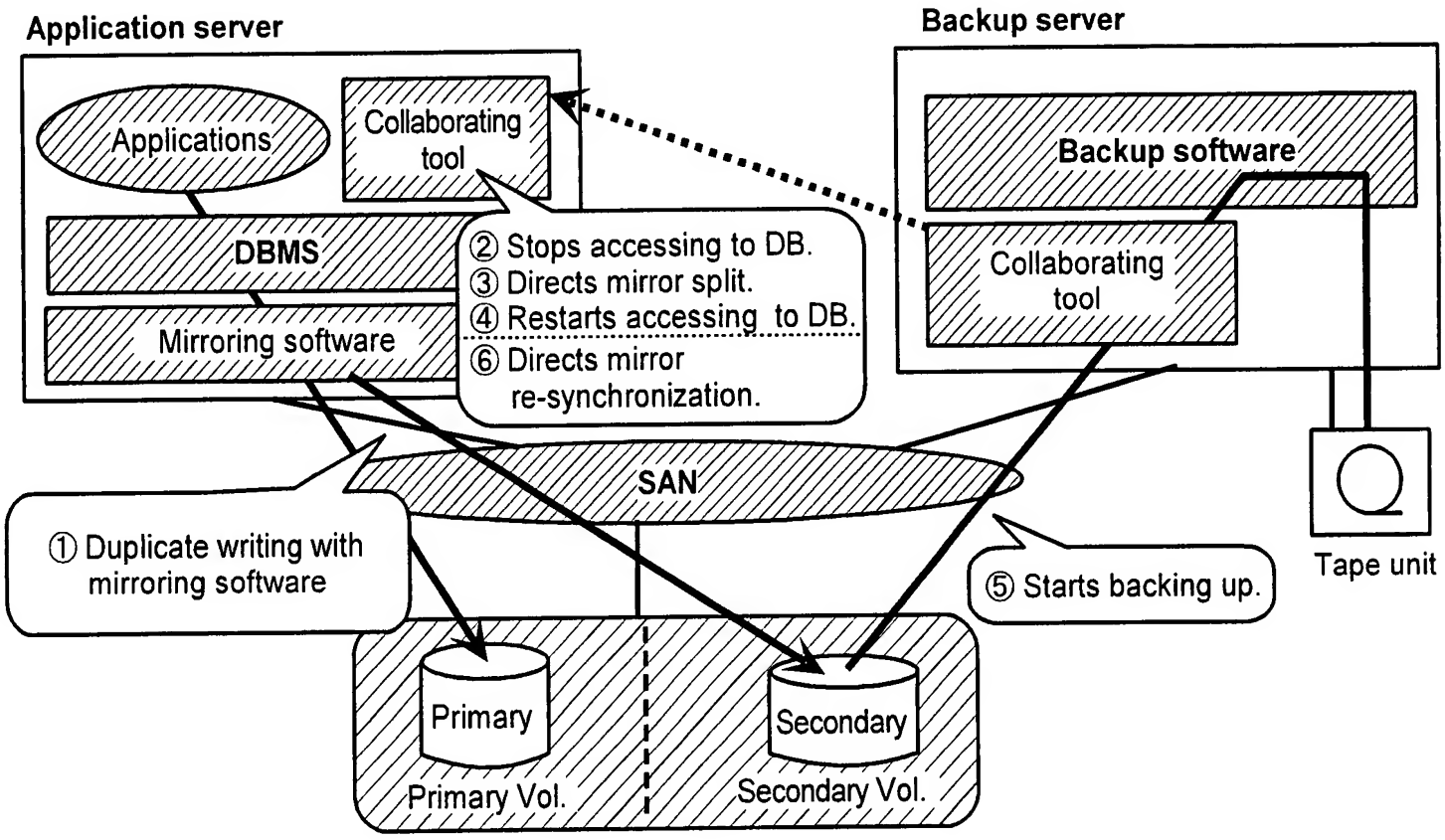

Application server
Backup server
Applications
Collaborating tool
DBMS
Mirroring software
Backup software
Collaborating tool
② Stops accessing to DB.
③ Directs mirror split.
④ Restarts accessing to DB.
⑥ Directs mirror re-synchronization.
SAN
① Duplicate writing with mirroring software
⑤ Starts backing up.
Tape unit
Primary
Secondary
Primary Vol.
Secondary Vol.

FIG.7

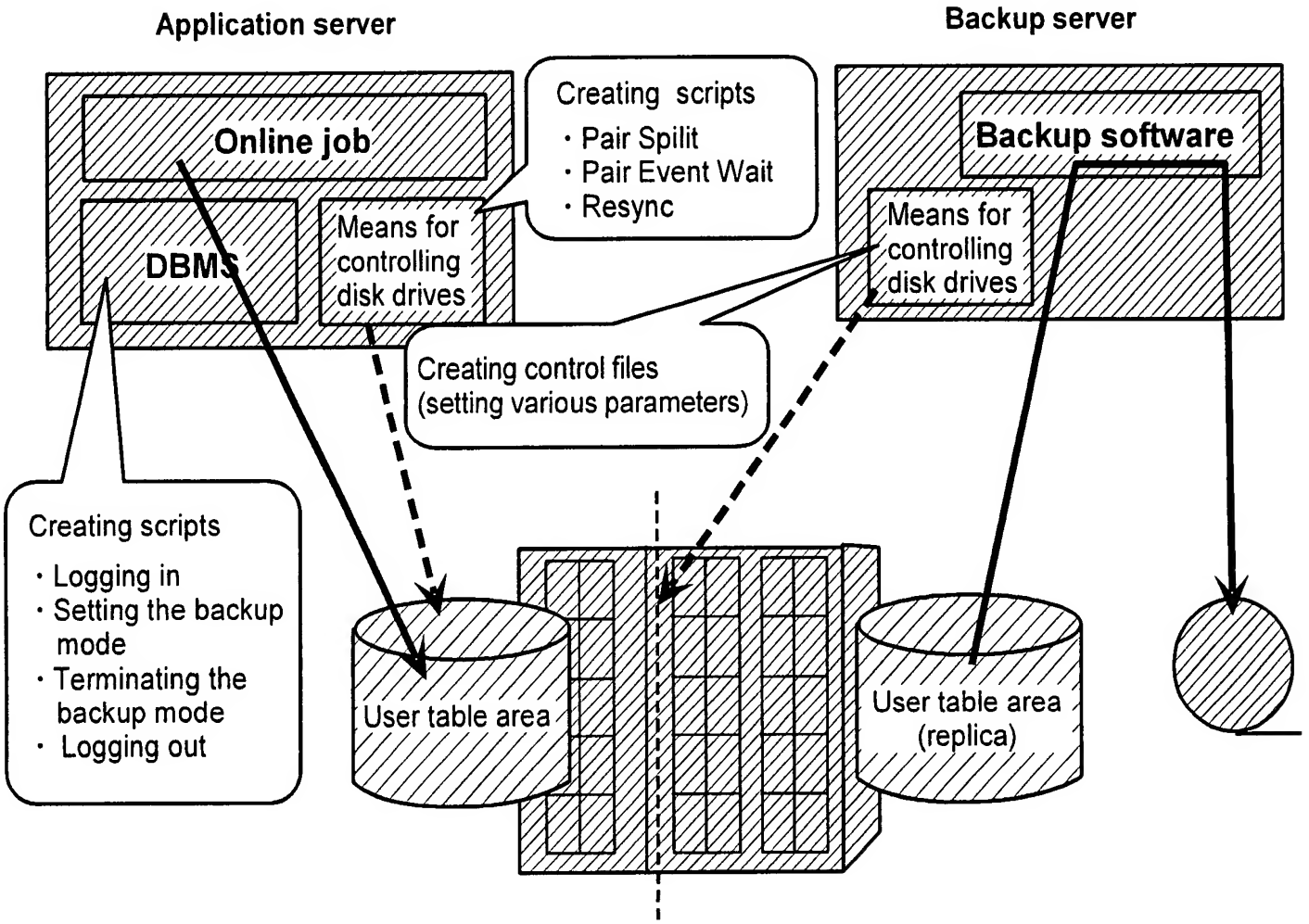

Application server
Backup server
Online job
DBMS
Means for controlling disk drives
Creating scripts
・Pair Spilit
・Pair Event Wait
・Resync
Backup software
Means for controlling disk drives
Creating control files (setting various parameters)
Creating scripts
・Logging in
・Setting the backup mode
・Terminating the backup mode
・Logging out
User table area
User table area (replica)

FIG.8

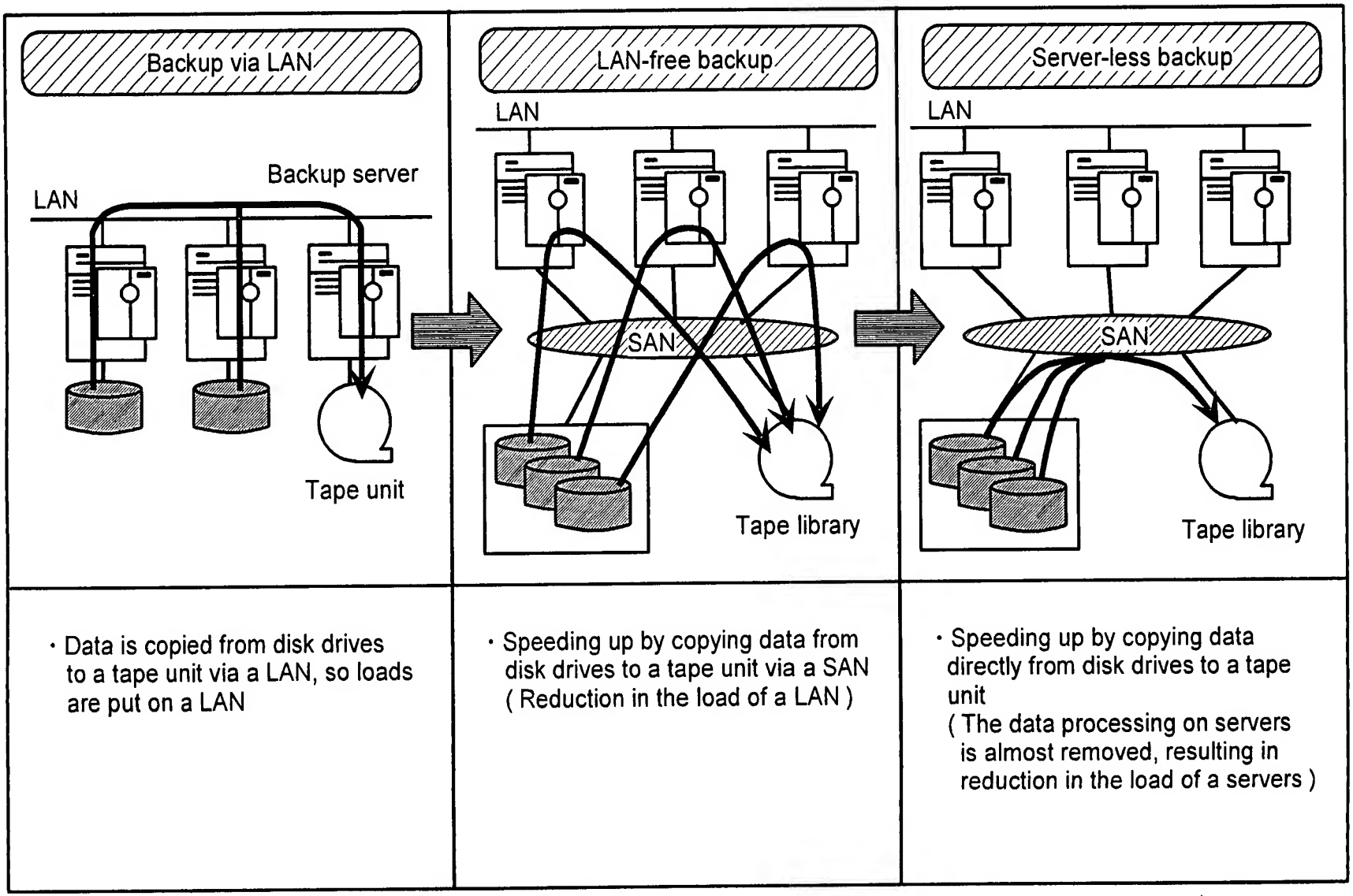

Backup via LAN
LAN
Backup server
Tape unit
LAN-free backup
LAN
SAN
Tape library
Server-less backup
LAN
SAN
Tape library
・Data is copied from disk drives to a tape unit via a LAN, so loads are put on a LAN
・Speeding up by copying data from disk drives to a tape unit via a SAN (Reduction in the load of a LAN)
・Speeding up by copying data directly from disk drives to a tape unit (The data processing on servers is almost removed, resulting in reduction in the load of a servers)

FIG.9

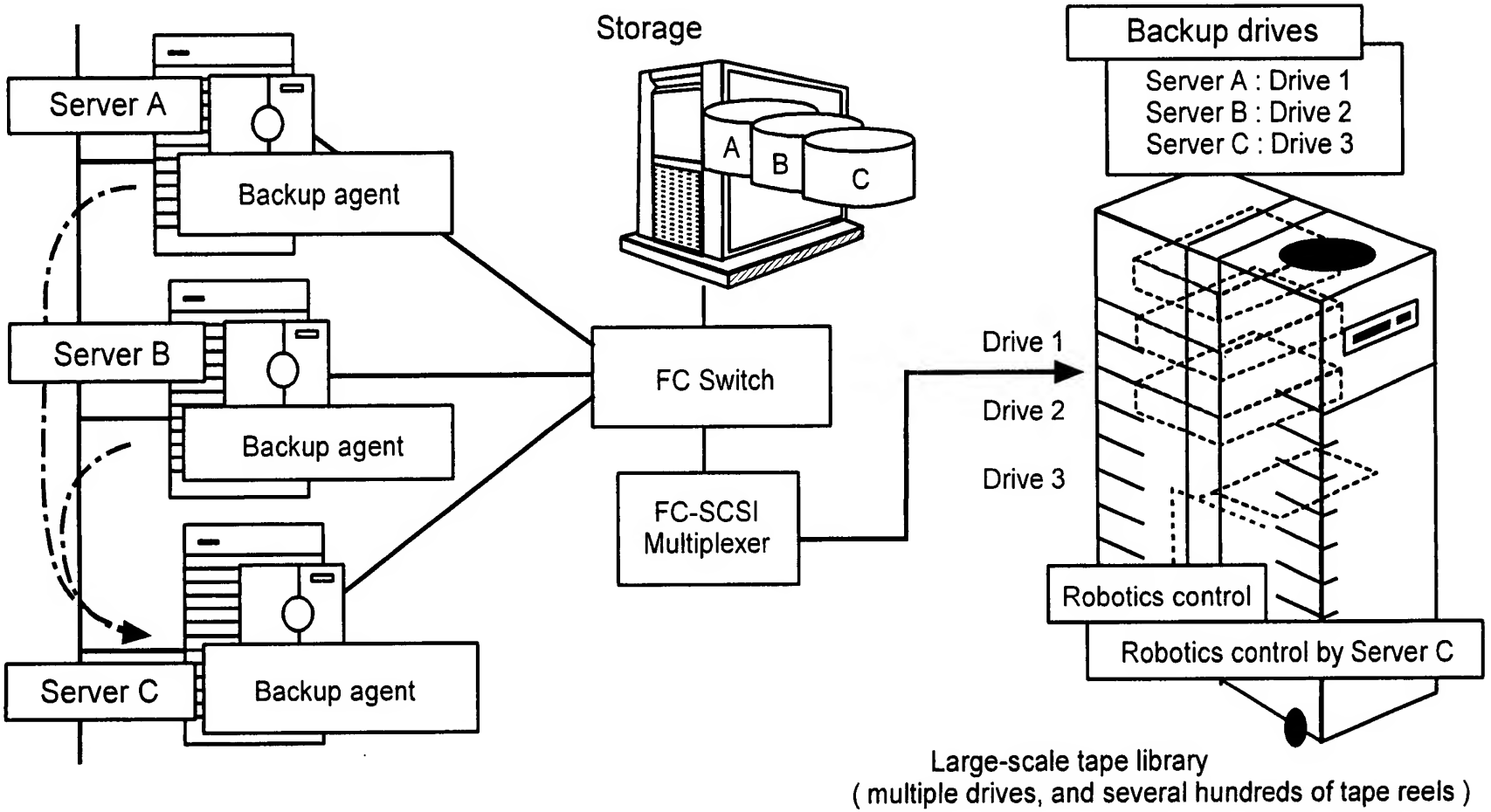

Storage
Backup drives
Server A : Drive 1
Server B : Drive 2
Server C : Drive 3
Server A
Backup agent
A
B
C
Server B
Backup agent
FC Switch
Drive 1
Drive 2
Drive 3
FC-SCSI
Multiplexer
Server C
Backup agent
Robotics control
Robotics control by Server C
Large-scale tape library
(multiple drives, and several hundreds of tape reels)

FIG.10

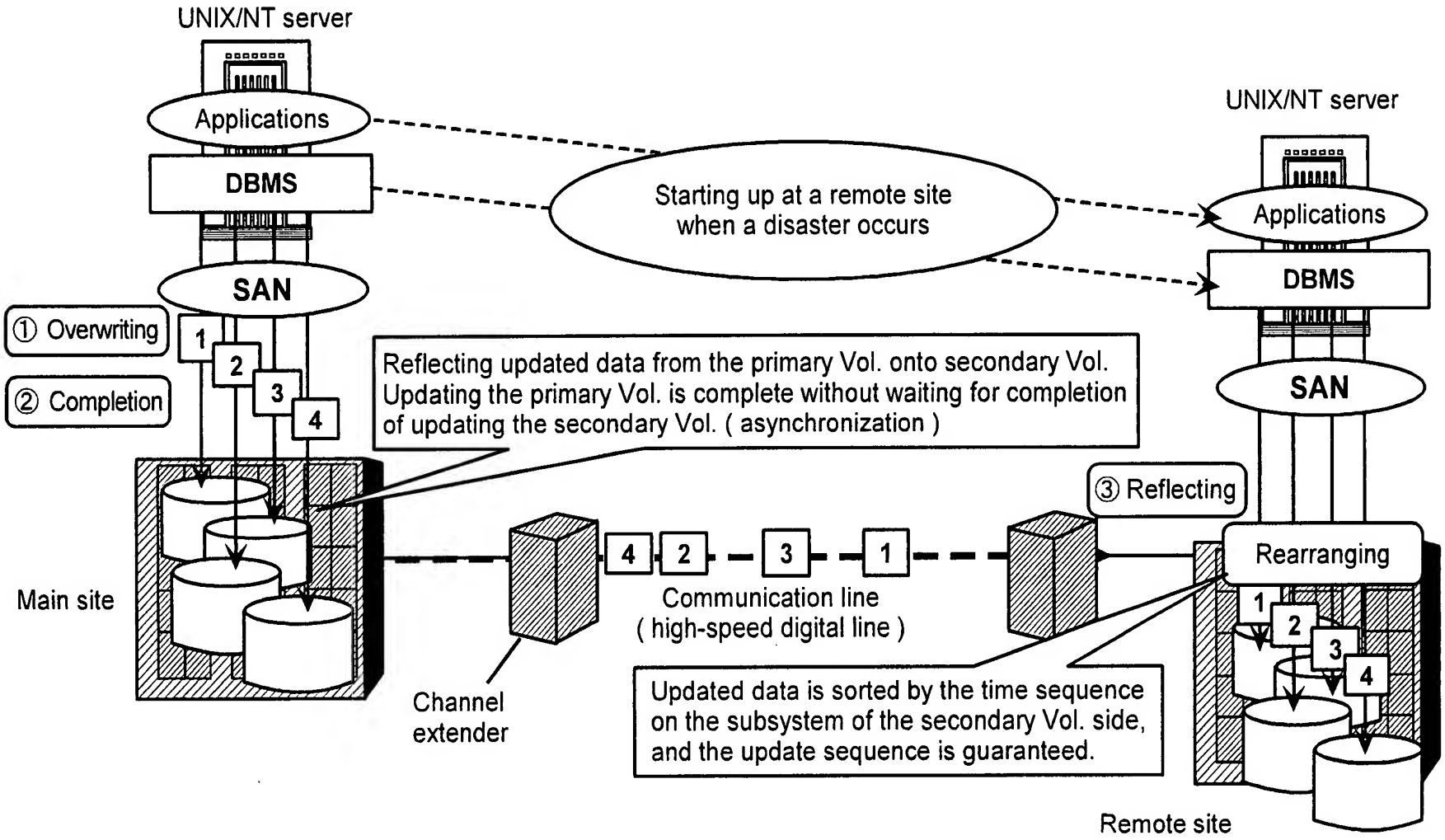

UNIX/NT server
Applications
DBMS
SAN
① Overwriting
② Completion
1
2
3
4
Reflecting updated data from the primary Vol. onto secondary Vol.
Updating the primary Vol. is complete without waiting for completion
of updating the secondary Vol. (asynchronization)
Main site
Channel
extender
4
2
3
1
Communication line
(high-speed digital line)
Starting up at a remote site
when a disaster occurs
UNIX/NT server
Applications
DBMS
SAN
③ Reflecting
Rearranging
1
2
3
4
Updated data is sorted by the time sequence
on the subsystem of the secondary Vol. side,
and the update sequence is guaranteed.
Remote site

FIG.11

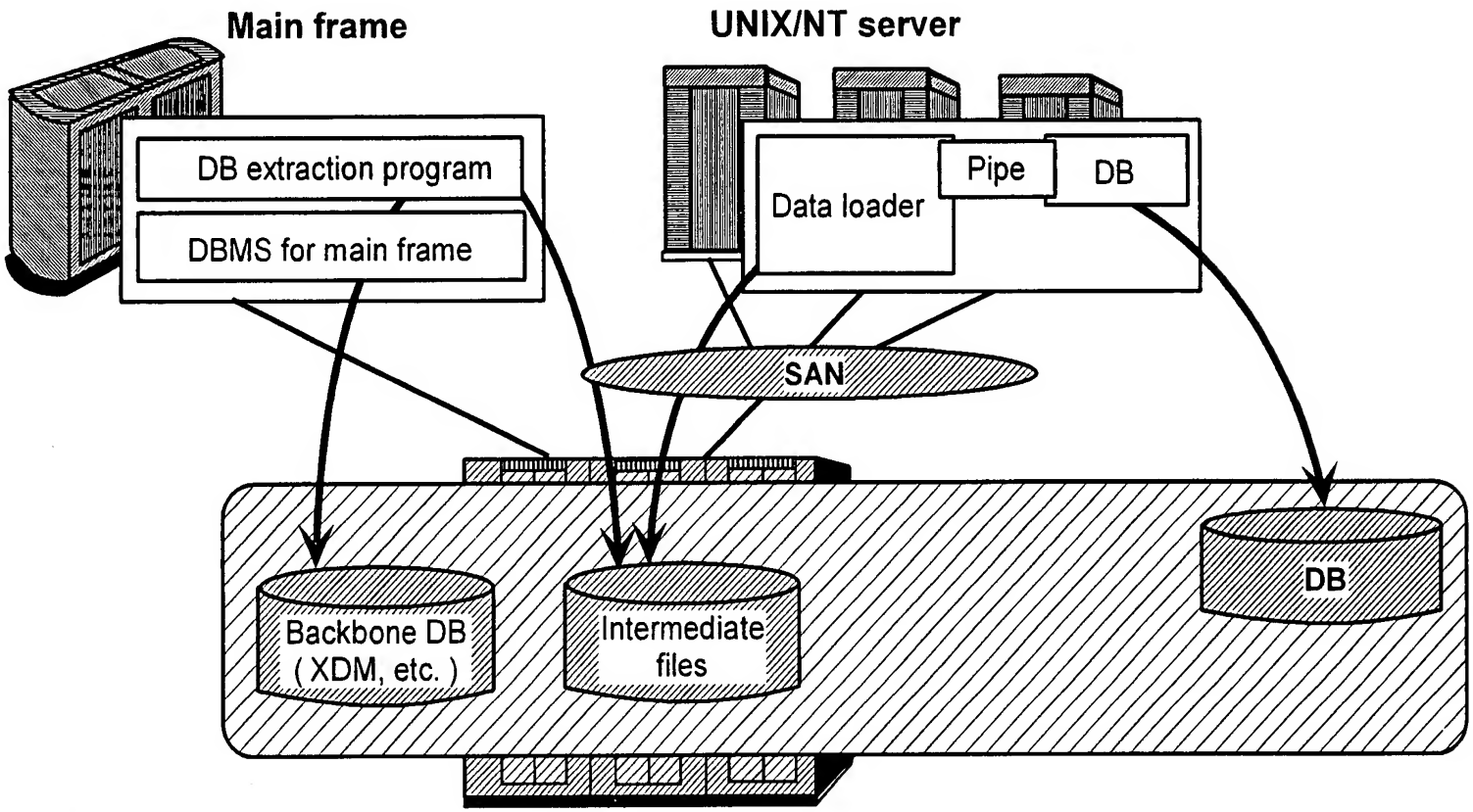

Main frame
UNIX/NT server
DB extraction program
DBMS for main frame
Data loader
Pipe
DB
SAN
Backbone DB
(XDM, etc.)
Intermediate
files
DB

FIG.12

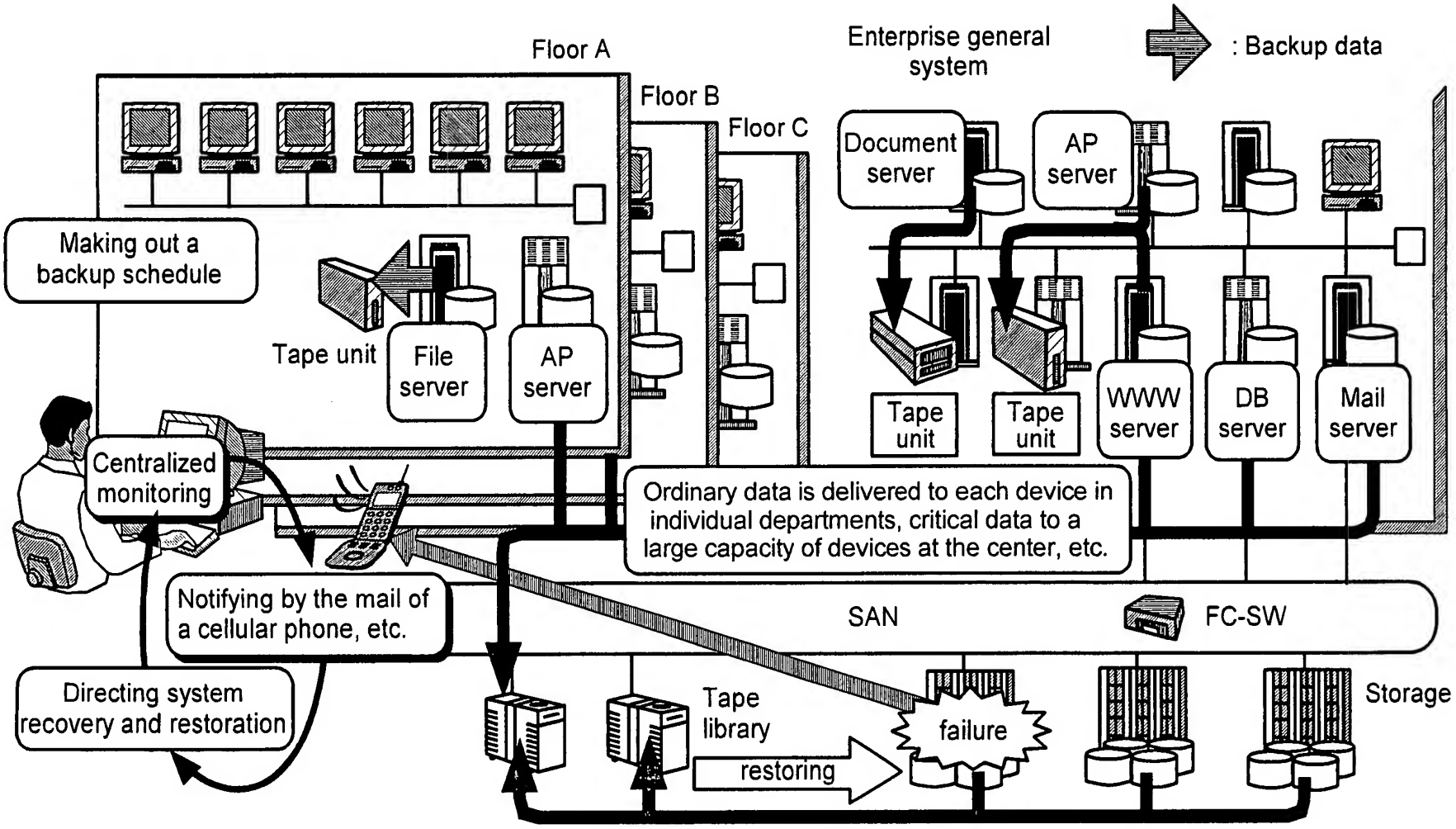

Floor A
Floor B
Floor C
Enterprise general system
: Backup data
Document server
AP server
Making out a backup schedule
Tape unit
File server
AP server
Tape unit
Tape unit
WWW server
DB server
Mail server
Centralized monitoring
Ordinary data is delivered to each device in individual departments, critical data to a large capacity of devices at the center, etc.
Notifying by the mail of a cellular phone, etc.
SAN
FC-SW
Directing system recovery and restoration
Tape library
failure
Storage
restoring

FIG.13

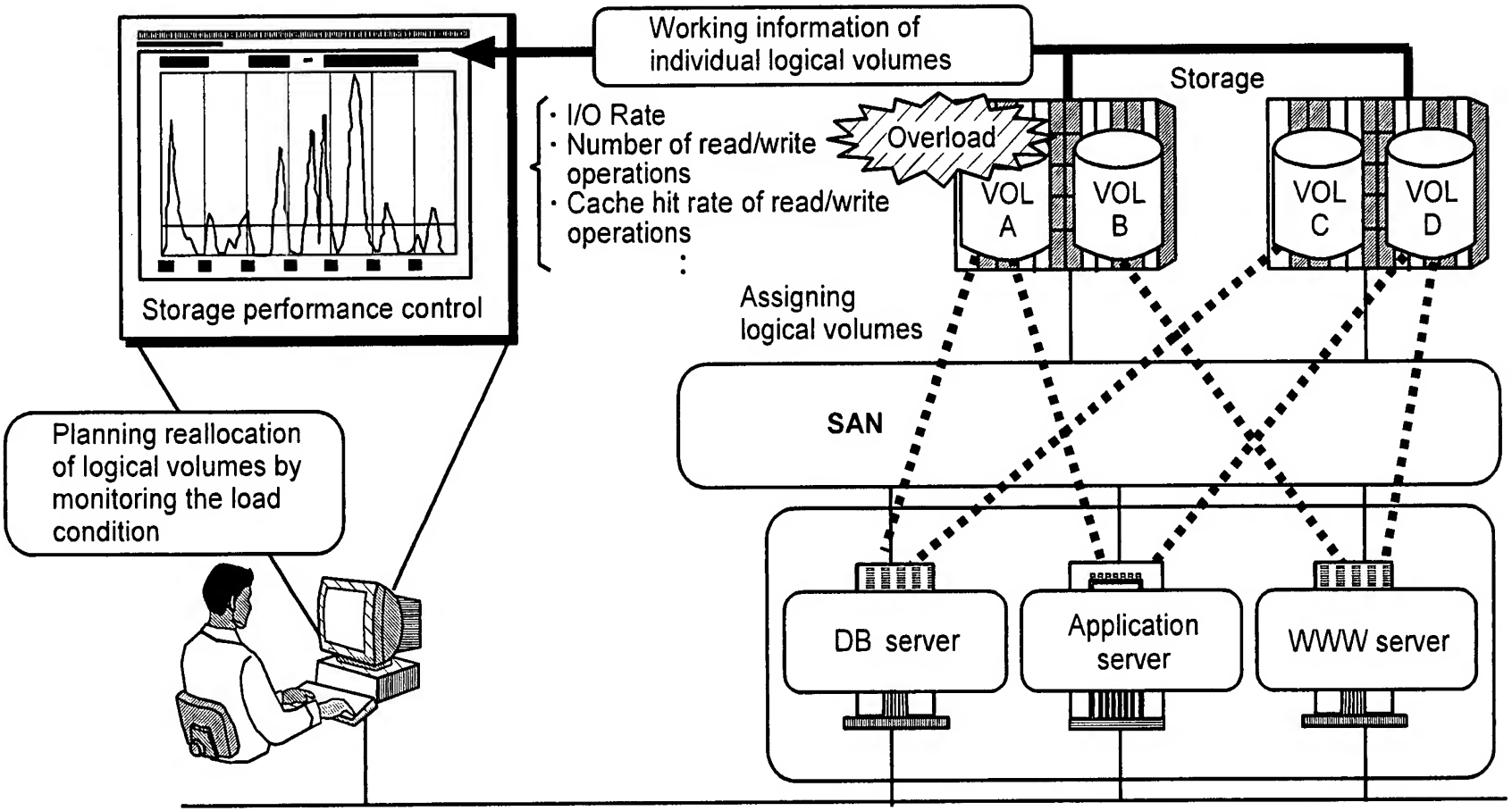
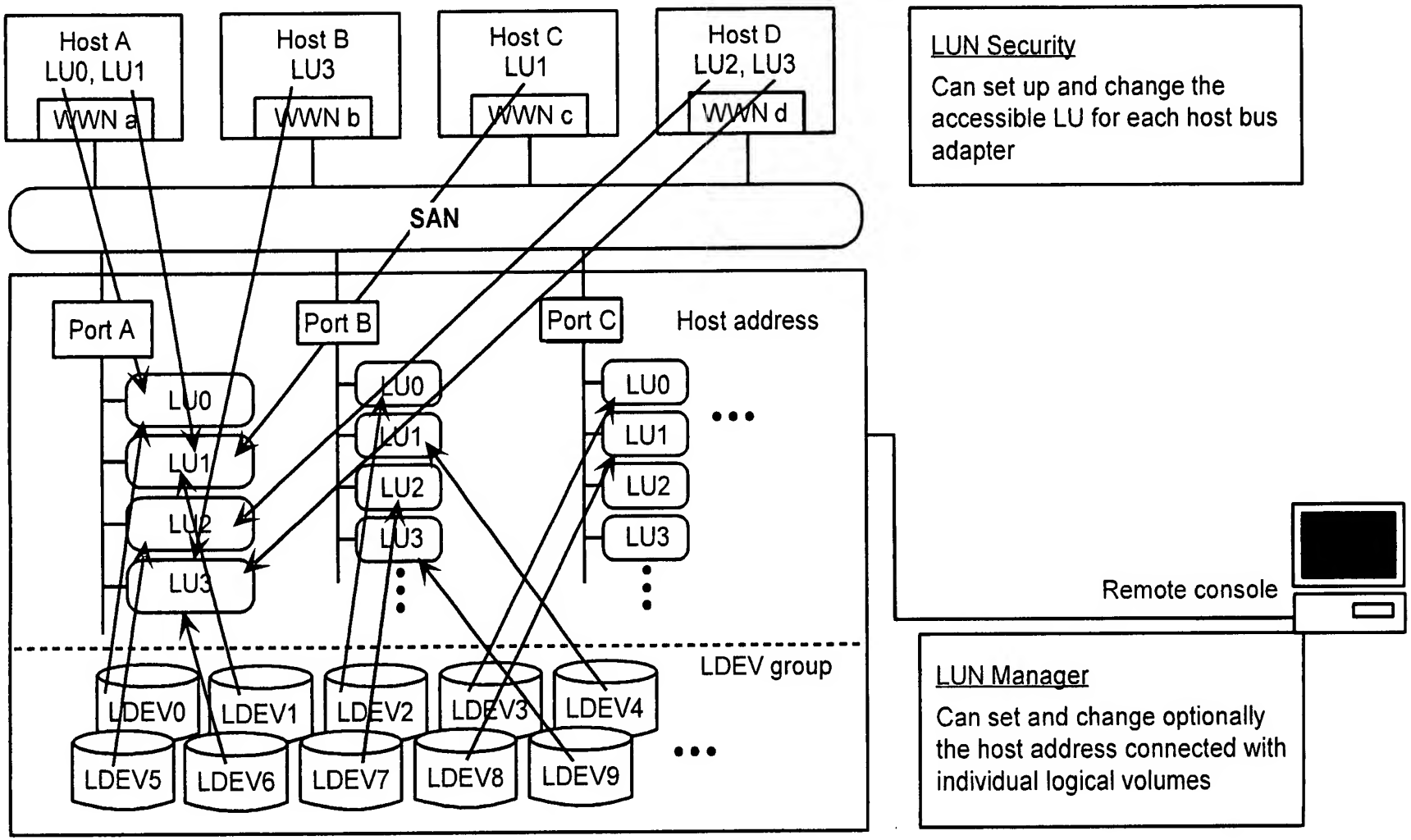

Working information of individual logical volumes
Storage
· I/O Rate
· Number of read/write operations
· Cache hit rate of read/write operations
:
Overload
VOL A
VOL B
VOL C
VOL D
Storage performance control
Assigning logical volumes
SAN
Planning reallocation of logical volumes by monitoring the load condition
DB server
Application server
WWW server

FIG.14



LUN : Logical Unit Number, LDEV : Logical device management logical volume

FIG.15

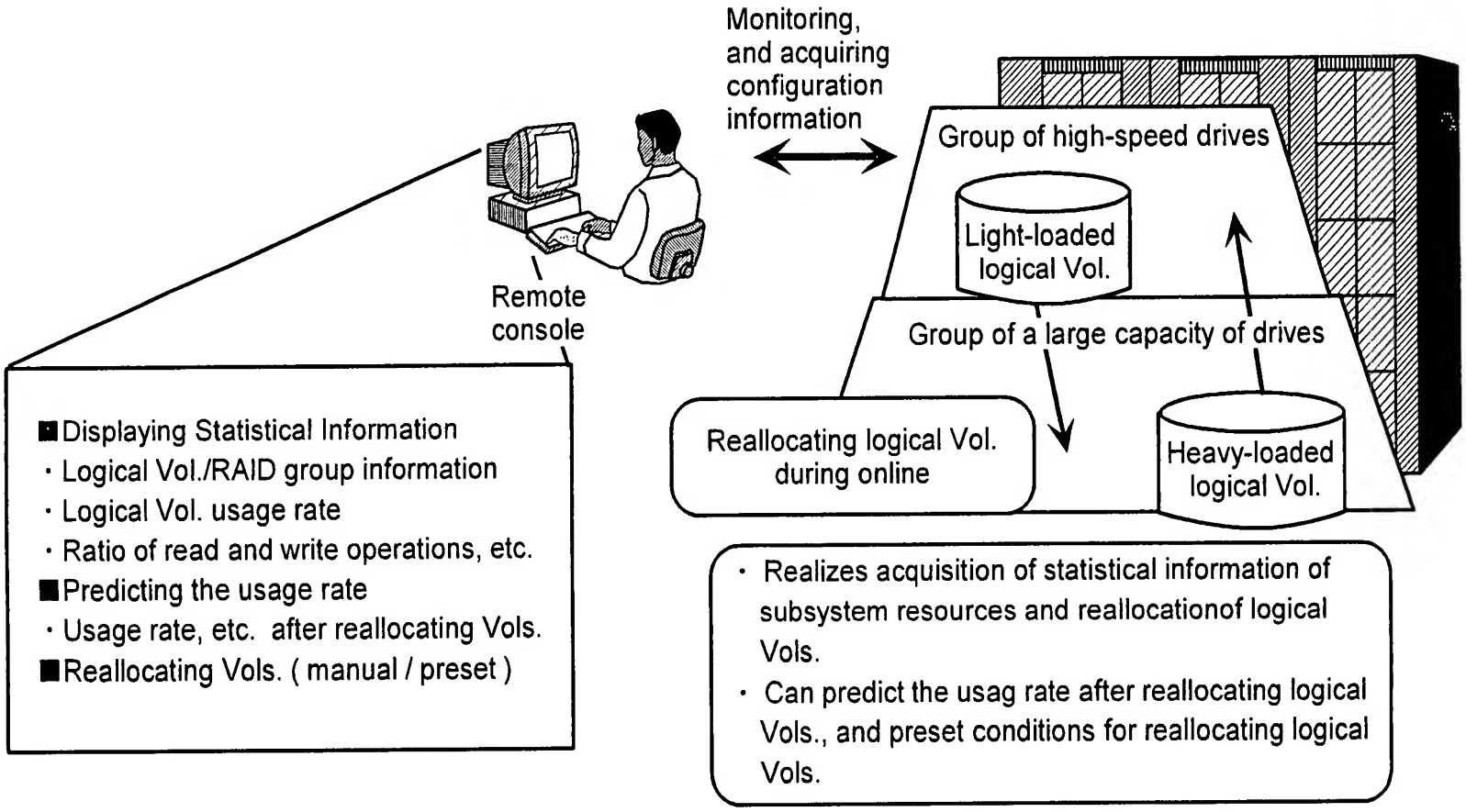

Monitoring,
and acquiring
configuration
information
Group of high-speed drives
Light-loaded
logical Vol.
Group of a large capacity of drives
Reallocating logical Vol.
during online
Heavy-loaded
logical Vol.
Remote
console
■Displaying Statistical Information
・Logical Vol./RAID group information
・Logical Vol. usage rate
・Ratio of read and write operations, etc.
■Predicting the usage rate
・Usage rate, etc. after reallocating Vols.
■Reallocating Vols. (manual / preset)
・Realizes acquisition of statistical information of subsystem resources and reallocationof logical Vols.
・Can predict the usag rate after reallocating logical Vols., and preset conditions for reallocating logical Vols.

FIG.16

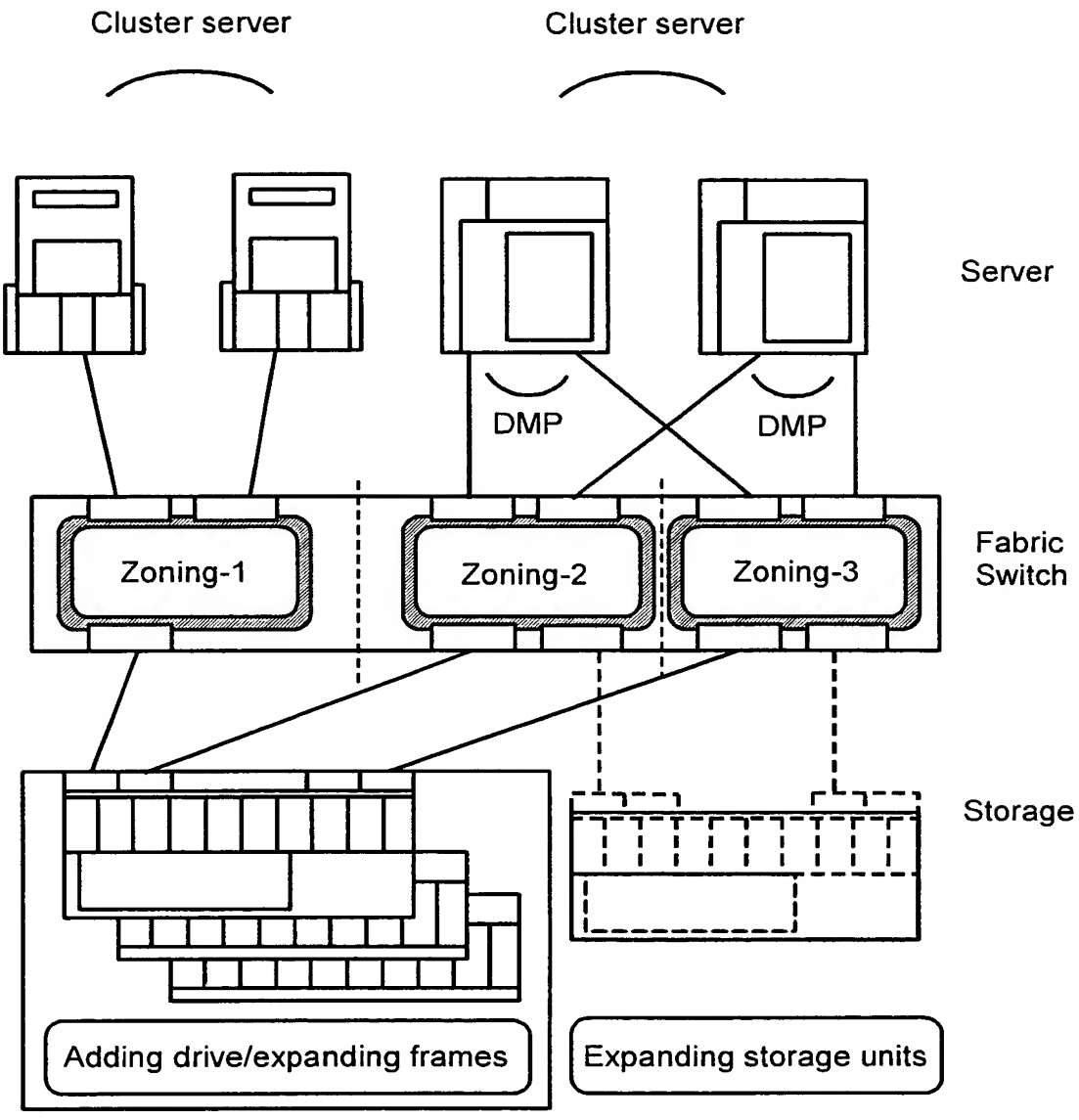

Cluster server
Cluster server
Server
DMP
DMP
Zoning-1
Zoning-2
Zoning-3
Fabric Switch
Storage
Adding drive/expanding frames
Expanding storage units

FIG.17

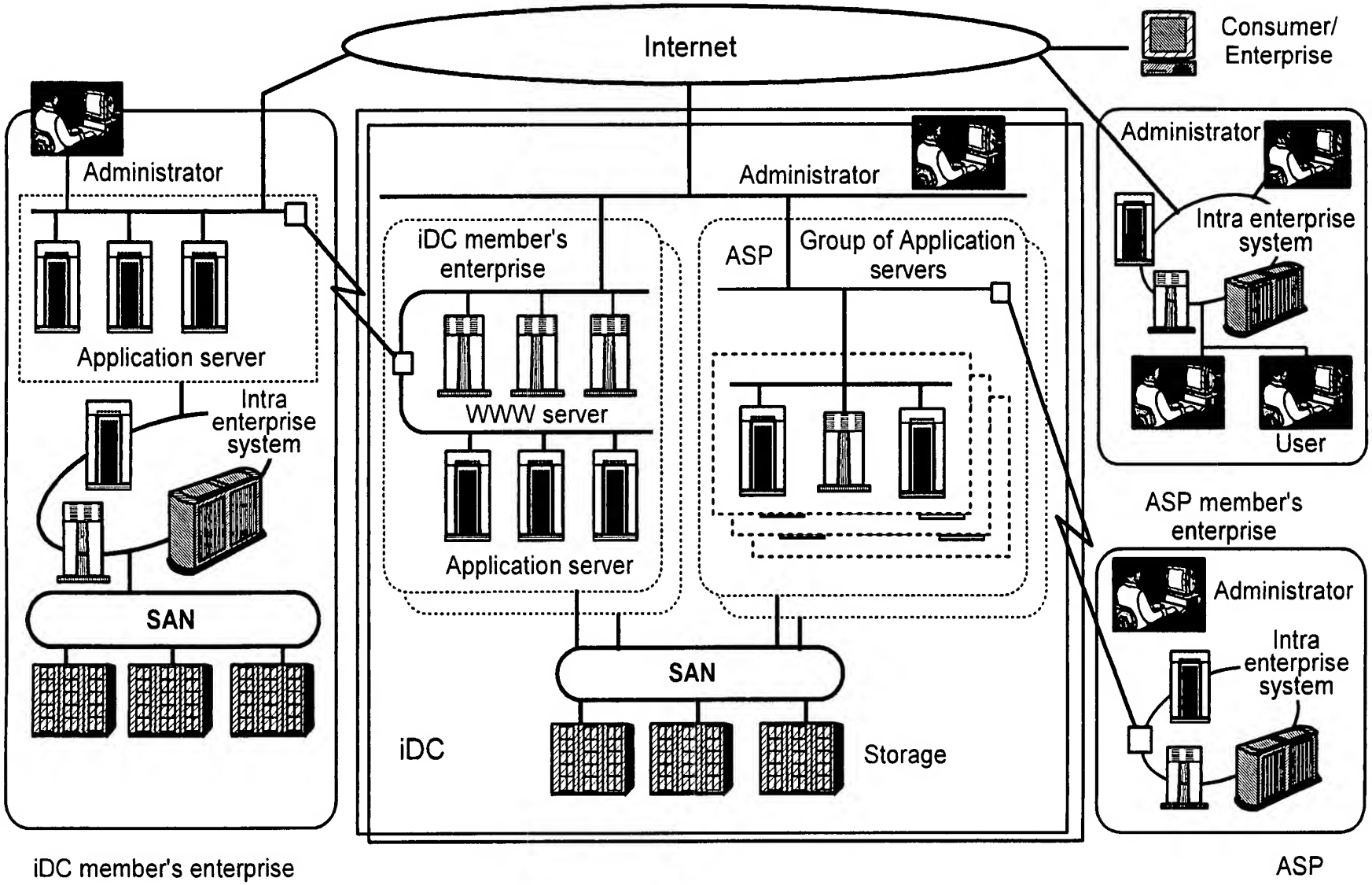

Internet
Consumer/
Enterprise
Administrator
Application server
Intra
enterprise
system
SAN
iDC member's enterprise
Administrator
iDC member's
enterprise
ASP
Group of Application
servers
WWW server
Application server
SAN
iDC
Storage
Administrator
Intra enterprise
system
User
ASP member's
enterprise
Administrator
Intra
enterprise
system
ASP

FIG.18

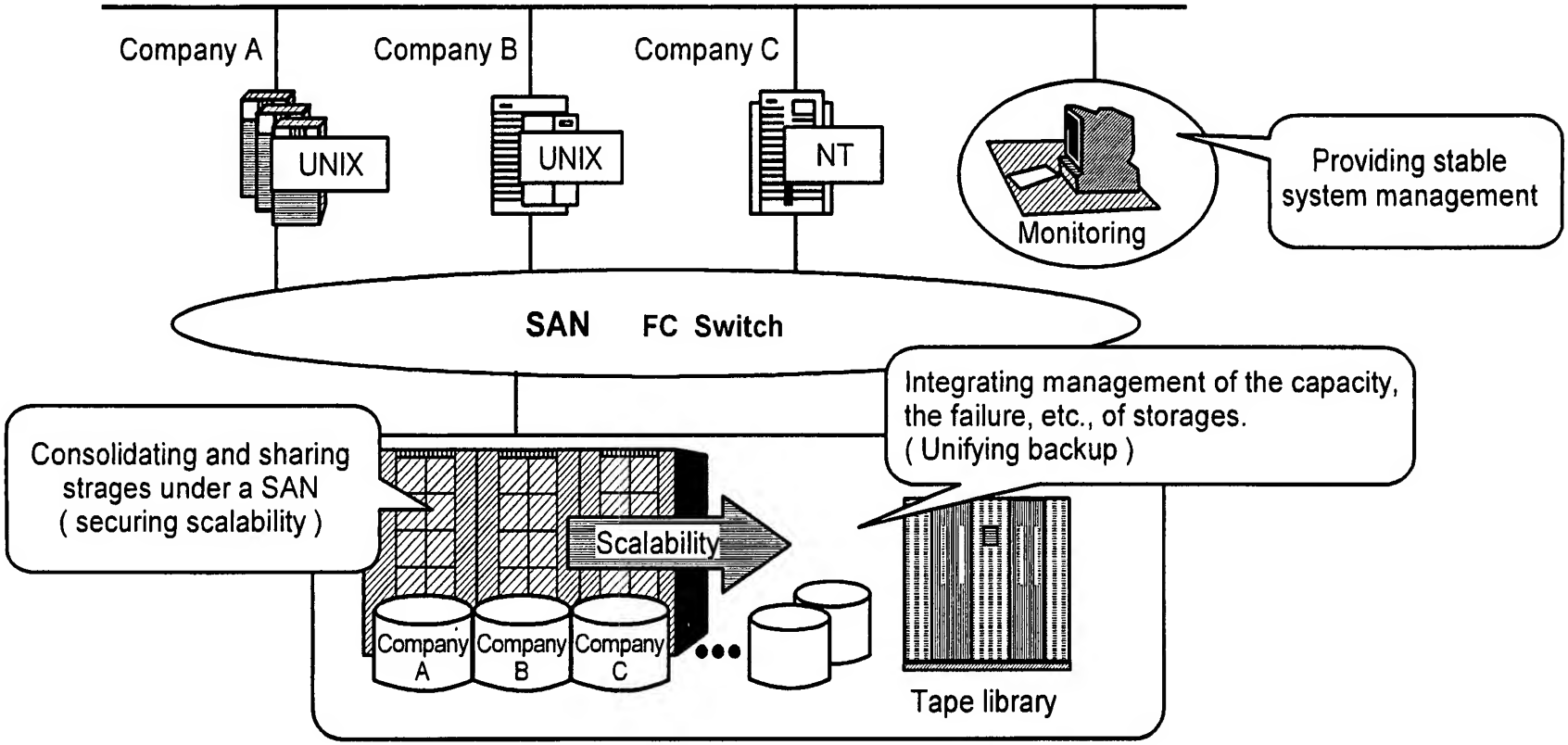

Company A
Company B
Company C
UNIX
UNIX
NT
Monitoring
Providing stable system management
SAN FC Switch
Integrating management of the capacity, the failure, etc., of storages. (Unifying backup)
Consolidating and sharing strages under a SAN (securing scalability)
Scalability
Company A
Company B
Company C
Tape library

FIG.19

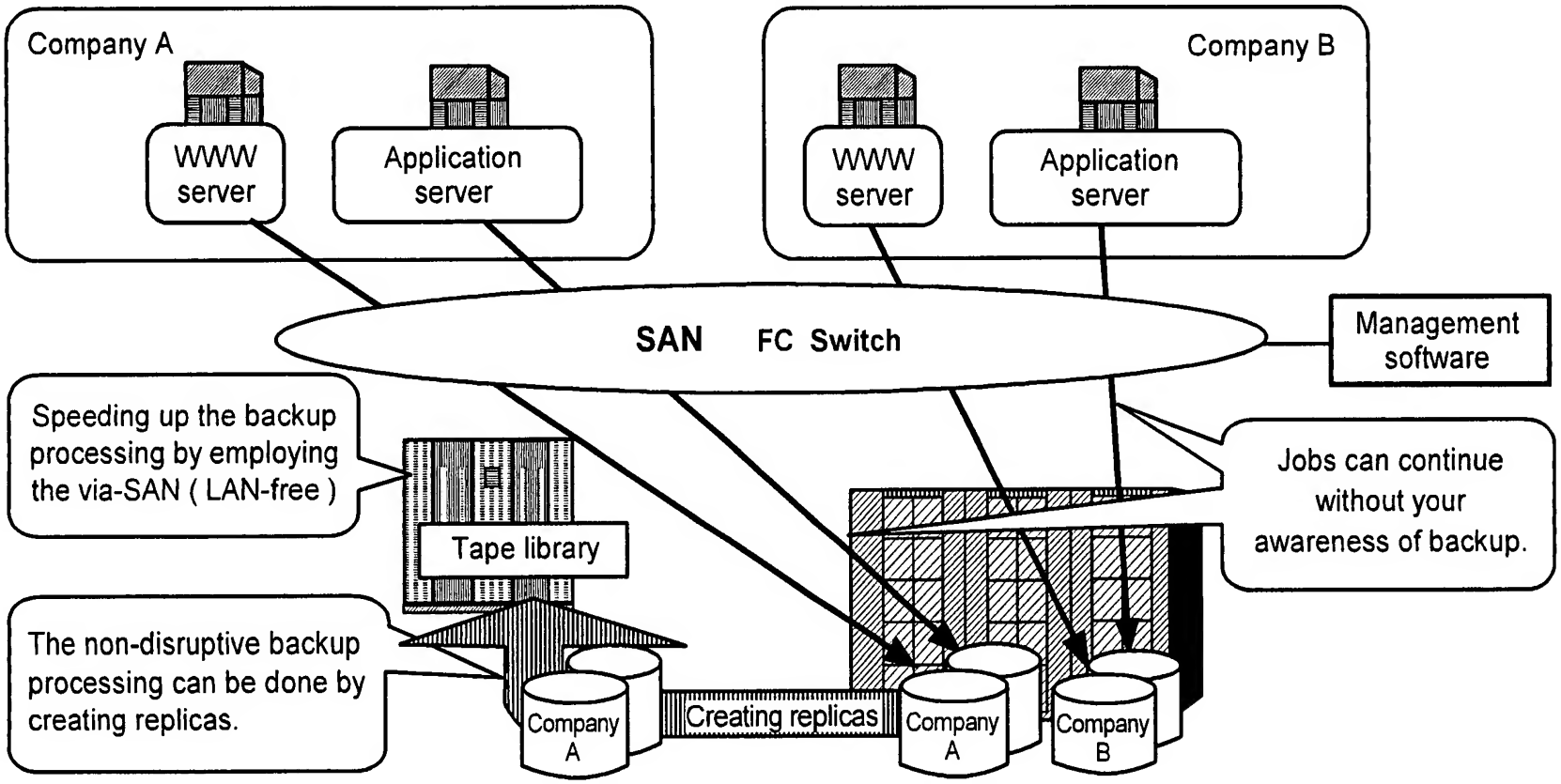

Company A
WWW server
Application server
Company B
WWW server
Application server
SAN FC Switch
Management software
Speeding up the backup processing by employing the via-SAN (LAN-free)
Tape library
Jobs can continue without your awareness of backup.
The non-disruptive backup processing can be done by creating replicas.
Company A
Creating replicas
Company A
Company B

FIG.20

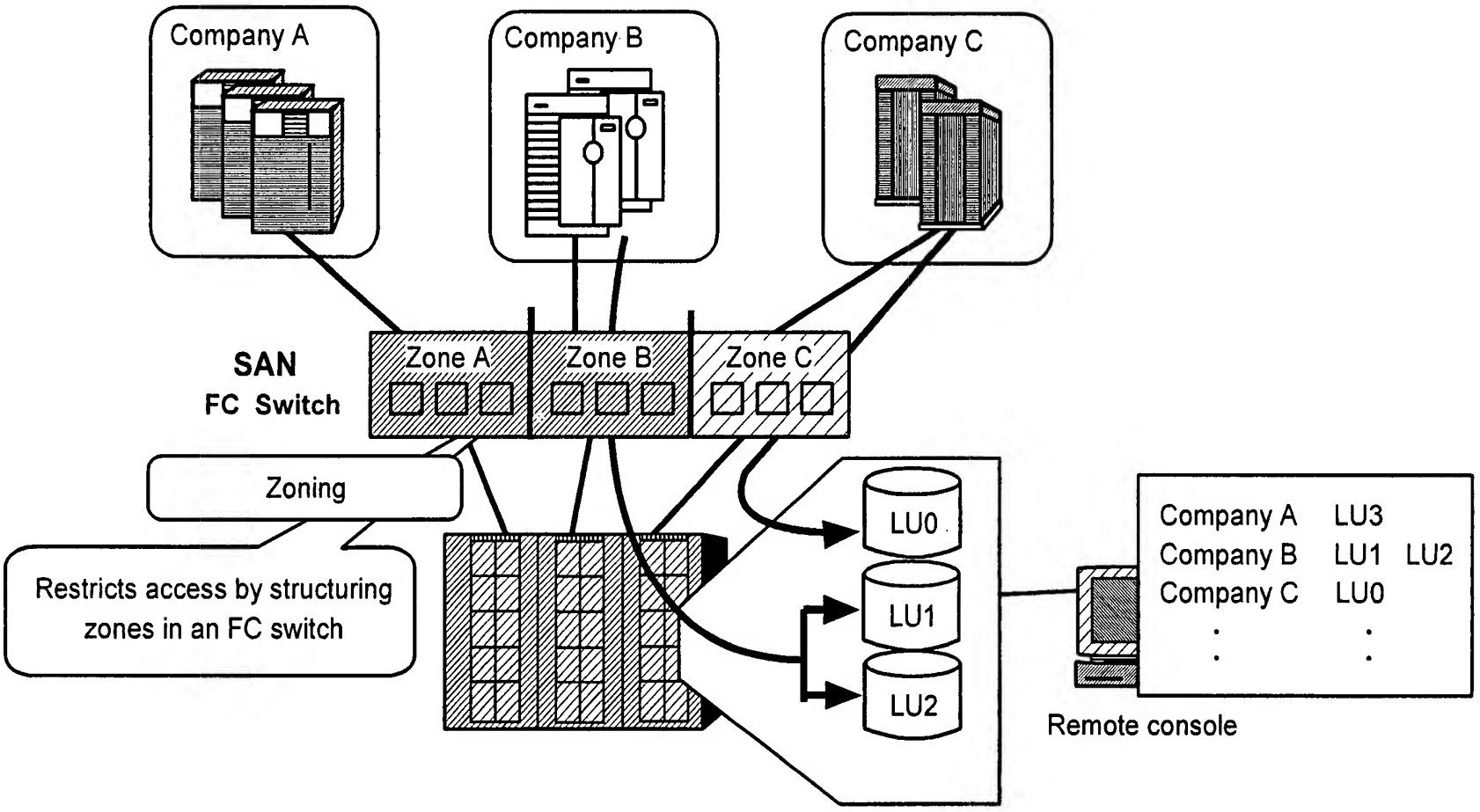
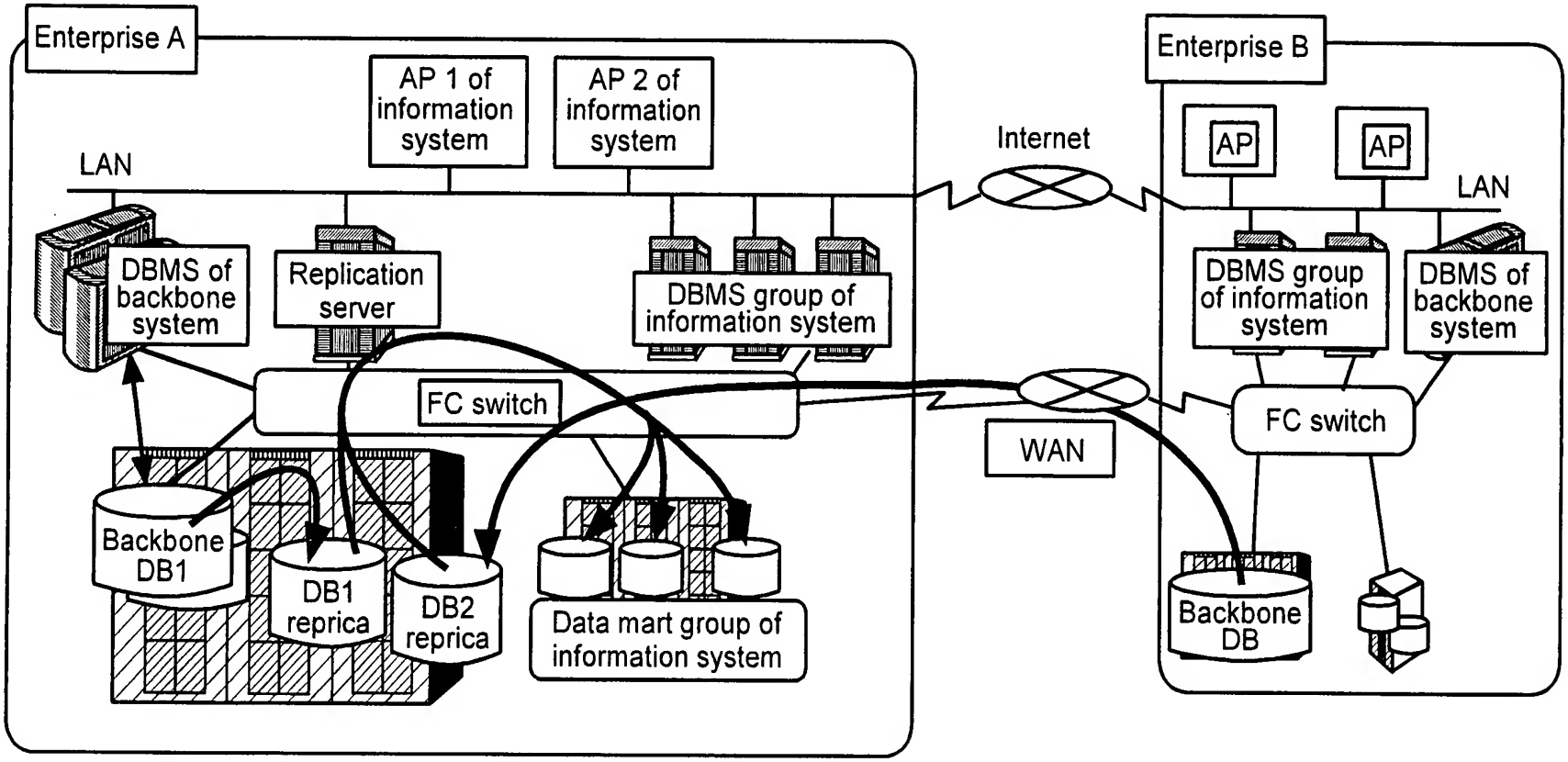

Company A
Company B
Company C
SAN
FC Switch
Zone A
Zone B
Zone C
Zoning
Restricts access by structuring zones in an FC switch
LU0
LU1
LU2
Company A LU3
Company B LU1 LU2
Company C LU0
Remote console

FIG.21


Enterprise A
AP 1 of information system
AP 2 of information system
LAN
DBMS of backbone system
Replication server
DBMS group of information system
FC switch
Backbone DB1
DB1 reprica
DB2 reprica
Data mart group of information system
Internet
WAN
Enterprise B
AP
AP
LAN
DBMS group of information system
DBMS of backbone system
FC switch
Backbone DB